

(1) Auxiliary engines and associated fuel-system components must be installed when testing complete vehicles. If the auxiliary engine draws fuel from a separate fuel tank, you must fill the extra fuel tank before the start of diurnal testing as described for the vehicle's main fuel tank. Use good engineering judgment to ensure that any nonmetal portions of the fuel system related to the auxiliary engine have reached stabilized levels of permeation emissions. The auxiliary engine must not operate during the running loss test or any other portion of testing under this section.

(2) For testing with incomplete vehicles, you may omit installation of auxiliary engines and associated fuel-system components as long as those components installed in the final configuration are certified to meet the applicable emission standards for Small SI equipment described in 40 CFR 1054.112 or for Large SI engines in 40 CFR 1048.105. For any fuel-system components that you do not install, your installation instructions must describe this certification requirement.

[79 FR 23749, Apr. 28, 2014]

**§ 1037.104 Exhaust emission standards for CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O for heavy-duty vehicles at or below 14,000 pounds GVWR.**

This section applies for heavy-duty vehicles at or below 14,000 pounds GVWR. See paragraph (f) of this section and § 1037.150 of this section for provisions excluding certain vehicles from this section, and allowing other vehicles to be certified under this section.

(a) *Fleet-average CO<sub>2</sub> emission standards.* Fleet-average CO<sub>2</sub> emission stand-

ards apply for each manufacturer as follows:

(1) Calculate a work factor, WF, for each vehicle subconfiguration (or group of subconfigurations allowed under paragraph (a)(4) of this section), rounded to the nearest pound, using the following equation:

$$WF = 0.75 \times (GVWR - \text{Curb Weight} + xwd) + 0.25 \times (GCWR - GVWR)$$

Where:

xwd = 500 pounds if the vehicle has four-wheel drive or all-wheel drive; xwd = 0 pounds for all other vehicles.

(2) Using the appropriate work factor, calculate a target value for each vehicle subconfiguration (or group of subconfigurations allowed under paragraph (a)(4) of this section) you produce using one of the following equations, or the phase-in provisions in § 1037.150(b), rounding to the nearest 0.1 g/mile:

(i) For spark-ignition vehicles: CO<sub>2</sub> Target (g/mile) = 0.0440 × WF + 339

(ii) For compression-ignition vehicles and vehicles that operate without engines (such as electric vehicles and fuel cell vehicles): CO<sub>2</sub> Target (g/mile) = 0.0416 × WF + 320

(3) Calculate a production-weighted average of the target values and round it to the nearest 0.1 g/mile. This is your fleet-average standard. All vehicles subject to the standards of this section form a single averaging set. Use the following equation to calculate your fleet-average standard from the target value for each vehicle subconfiguration (Target<sub>*i*</sub>) and U.S.-directed production volume of each vehicle subconfiguration for the given model year (Volume<sub>*i*</sub>):

$$\text{Fleet-Average Standard} = \frac{\sum [\text{Target}_i \times \text{Volume}_i]}{\sum [\text{Volume}_i]}$$

(4) You may group subconfigurations within a configuration together for purposes of calculating your fleet-average standard as follows:

(i) You may group together subconfigurations that have the same

equivalent test weight (ETW), GVWR, and GCWR. Calculate your work factor and target value assuming a curb weight equal to two times ETW minus GVWR.

(ii) You may group together other subconfigurations if you use the lowest target value calculated for any of the subconfigurations.

(b) *Production and in-use CO<sub>2</sub> standards.* Each vehicle you produce that is subject to the standards of this section has an “in-use” CO<sub>2</sub> standard that is calculated from your test result and that applies for selective enforcement audits and in-use testing. This in-use CO<sub>2</sub> standard for each vehicle is equal to the applicable deteriorated emission level multiplied by 1.10 and rounded to the nearest 0.1 g/mile.

(c) *N<sub>2</sub>O and CH<sub>4</sub> standards.* Except as allowed under this paragraph (c), all vehicles subject to the standards of this section must comply with an N<sub>2</sub>O standard of 0.05 g/mile and a CH<sub>4</sub> standard of 0.05 g/mile. You may specify CH<sub>4</sub> and/or N<sub>2</sub>O alternate standards using CO<sub>2</sub> emission credits instead of these otherwise applicable emission standards for one or more test groups, consistent with the provisions of 40 CFR 86.1818. To do this, calculate the CH<sub>4</sub> and/or N<sub>2</sub>O emission credits needed (negative credits) using the equation in this paragraph (c) based on the FEL(s) you specify for your vehicles during certification. You must adjust the calculated emissions by the global warming potential (GWP): GWP equals 25 for CH<sub>4</sub> and 298 for N<sub>2</sub>O. This means you must use 25 Mg of positive CO<sub>2</sub> credits to offset 1 Mg of negative CH<sub>4</sub> credits and 298 Mg of positive CO<sub>2</sub> credits to offset 1 Mg of negative N<sub>2</sub>O credits. Note that 40 CFR 86.1818–12(f) does not apply for vehicles subject to the standards of this section. Calculate credits using the following equation:

$$\text{CO}_2 \text{ Credits Needed (Mg)} = [(\text{FEL} - \text{Std}) \times (\text{U.S.-directed production volume}) \times (\text{Useful Life})] \times (\text{GWP}) \div 1,000,000$$

(d) *Compliance provisions.* Except as specified in this paragraph (d) or elsewhere in this section, the provisions of 40 CFR part 86, describing compliance with the greenhouse gas standards of 40 CFR part 86, subpart S, apply with respect to the standards of paragraphs (a) through (c) of this section.

(1) The CO<sub>2</sub> standards of this section apply with respect to CO<sub>2</sub> emissions, not with respect to carbon-related exhaust emissions (CREE).

(2) The following general credit provisions apply:

(i) Credits you generate under this section may be used only to offset credit deficits under this section. You may bank credits for use in a future model year in which your average CO<sub>2</sub> level exceeds the standard. You may trade credits to another manufacturer according to 40 CFR 86.1865–12(k)(8). Before you bank or trade credits, you must apply any available credits to offset a deficit if the deadline to offset that credit deficit has not yet passed.

(ii) Vehicles subject to the standards of this section are included in a single greenhouse gas averaging set separate from any averaging set otherwise included in 40 CFR part 86.

(iii) Banked CO<sub>2</sub> credits keep their full value for five model years after the year in which they were generated. Unused credits expire at the end of this fifth model year.

(3) Special credit and incentive provisions related to flexible fuel vehicles and air conditioning in 40 CFR part 86 do not apply for vehicles subject to the standards of this section.

(4) The CO<sub>2</sub>, N<sub>2</sub>O, and CH<sub>4</sub> standards apply for a weighted average of the city (55%) and highway (45%) test cycle results. Note that this differs from the way the criteria pollutant standards apply for heavy-duty vehicles.

(5) Apply an additive deterioration factor of zero to measured CO<sub>2</sub> emissions unless good engineering judgment indicates that emissions are likely to deteriorate in use. Use good engineering judgment to develop separate deterioration factors for N<sub>2</sub>O and CH<sub>4</sub>.

(6) Credits are calculated using the useful life value (in miles) in place of “vehicle lifetime miles” specified in 40 CFR part 86, subpart S. Calculate a total credit or debit balance in a model year by adding credits and debits from 40 CFR 86.1865–12(k)(4), subtracting any CO<sub>2</sub>-equivalent debits for N<sub>2</sub>O or CH<sub>4</sub> calculated according to §1037.104(c), and adding any of the following credits:

(i) Advanced technology credits according to paragraph (d)(7) of this section and §1037.150(i).

(ii) Innovative technology credits according to paragraph (d)(13) of this section.

(iii) Early credits according to § 1037.150(a)(2).

(7) Credits generated from hybrid vehicles with regenerative braking or from vehicles with other advanced technologies may be used to show compliance with any standards of this part or 40 CFR part 1036, subject to the service class restrictions in § 1037.740. Include these vehicles in a separate fleet-average calculation (and exclude them from your conventional fleet-average calculation). You must first apply these advanced technology vehicle credits to any deficits for other vehicles in the averaging set before applying them to other averaging sets.

(8) The provisions of 40 CFR 86.1818 do not apply.

(9) Calculate your fleet-average emission rate consistent with good engineering judgment and the provisions of 40 CFR 86.1865. The following additional provisions apply:

(i) Unless we approve a lower number, you must test at least ten subconfigurations. If you produce more than 100 subconfigurations in a given model year, you must test at least ten percent of your subconfigurations. For purposes of this paragraph (d)(9)(i), count carryover tests, but do not include analytically derived CO<sub>2</sub> emission rates, data substitutions, or other untested allowances. We may approve a lower number of tests for manufacturers that have limited product offerings, or low sales volumes. Note that good engineering judgment and other provisions of this part may require you to test more subconfigurations than these minimum values.

(ii) The provisions of paragraph (g) of this section specify how you may use analytically derived CO<sub>2</sub> emission rates.

(iii) At least 90 percent of final production volume at the configuration level must be represented by test data (real, data substituted, or analytical).

(iv) Perform fleet-average CO<sub>2</sub> calculations as described in 40 CFR 86.1865 and 40 CFR part 600, with the following exceptions:

(A) Use CO<sub>2</sub> emissions values for all test results, intermediate calculations, and fleet average calculations instead of the carbon-related exhaust emission

(CREE) values specified in 40 CFR parts 86 and 600.

(B) Perform intermediate CO<sub>2</sub> calculations for subconfigurations within each configuration using the subconfiguration and configuration definitions in paragraph (d)(12) of this section.

(C) Perform intermediate CO<sub>2</sub> calculations for configurations within each test group and transmission type (instead of configurations within each base level and base levels within each model type). Use the configuration definition in paragraph (d)(12)(i) of this section.

(D) Do not perform intermediate CO<sub>2</sub> calculations for each base level or for each model type. Base level and model type CO<sub>2</sub> calculations are not applicable to heavy-duty vehicles subject to standards in this section.

(E) Determine fleet average CO<sub>2</sub> emissions for heavy-duty vehicles subject to standards in this section as described in 40 CFR 600.510–12(j), except that the calculations must be performed on the basis of test group and transmission type (instead of the model-type basis specified in the light-duty vehicle regulations), and the calculations for dual fuel, multi-fuel, and flexible fuel vehicles must be consistent with the provisions of paragraph (d)(10)(i) of this section.

(10) For dual fuel, multi-fuel, and flexible fuel vehicles, perform exhaust testing on each fuel type (for example, gasoline and E85).

(i) For your fleet-average calculations, use either the conventional-fueled CO<sub>2</sub> emission rate or a weighted average of your emission results as specified in 40 CFR 600.510–12(k) for light-duty trucks.

(ii) If you certify to an alternate standard for N<sub>2</sub>O or CH<sub>4</sub> emissions, you may not exceed the alternate standard when tested on either fuel.

(11) Test your vehicles with an equivalent test weight based on its Adjusted Loaded Vehicle Weight (ALVW). Determine equivalent test weight from the ALVW as specified in 40 CFR 86.129, except that you may round values to the nearest 500 pound increment for ALVW above 14,000 pounds).

(12) The following definitions apply for the purposes of this section:

(i) Configuration means a subclassification within a test group based on engine code, transmission type and gear ratios, final drive ratio, and other parameters we designate. Transmission type means the basic type of the transmission (e.g., automatic, manual, automated manual, semi-automatic, or continuously variable) and does not include the drive system of the vehicle (e.g., front-wheel drive, rear-wheel drive, or four-wheel drive). Engine code means the combination of both “engine code” and “basic engine” as defined in 40 CFR 600.002. Note that this definition differs from the one in 40 CFR 86.1803.

(ii) Subconfiguration means a unique combination within a vehicle configuration (as defined in this paragraph (d)(12)) of equivalent test weight, road-load horsepower, and any other operational characteristics or parameters that we determine may significantly affect CO<sub>2</sub> emissions within a vehicle configuration. Note that for vehicles subject to standards of this section, equivalent test weight (ETW) is based on the ALVW of the vehicle as outlined in paragraph (d)(11) of this section.

(iii) The terms “complete vehicle” and “incomplete vehicle” have the meanings given for “complete heavy-duty vehicle” and “incomplete heavy-duty vehicle”, respectively, in 40 CFR 86.1803.

(13) This paragraph (d)(13) applies for CO<sub>2</sub> reductions resulting from technologies that were not in common use before 2010 that are not reflected in the specified test procedures. We may allow you to generate emission credits consistent with the provisions of 40 CFR 86.1869–12(c) and (d). You do not need to provide justification for not using the 5-cycle methodology.

(14) You must submit pre-model year reports before you submit your applications for certification for a given model year. Unless we specify otherwise, include the information specified for pre-model year reports in 49 CFR 535.8.

(15) You must submit a final report within 90 days after the end of the model year. Unless we specify otherwise, include applicable information identified in 40 CFR 86.1865–12(1), 40 CFR 600.512, and 49 CFR 535.8(e). The

final report must include at least the following information:

- (i) Model year.
- (ii) Applicable fleet-average CO<sub>2</sub> standard.
- (iii) Calculated fleet-average CO<sub>2</sub> value and all the values required to calculate the CO<sub>2</sub> value.
- (iv) Number of credits or debits incurred and all values required to calculate those values.
- (v) Resulting balance of credits or debits.
- (vi) N<sub>2</sub>O emissions.
- (vii) CH<sub>4</sub> emissions.
- (viii) HFC leakage score.

(e) *Useful life.* Your vehicles must meet the exhaust emission standards of this section throughout their full useful life, expressed in service miles or calendar years, whichever comes first. The useful life values for the standards of this section are those that apply for criteria pollutants under 40 CFR part 86.

(f) *Exclusion of vehicles not certified as complete vehicles.* The standards of this section apply for each vehicle that is chassis-certified with respect to criteria pollutants under 40 CFR part 86, subpart S. The standards of this section do not apply for other vehicles, except as noted in § 1037.150. Note that vehicles excluded under this paragraph (f) are not considered to be “subject to the standards of this section.” The vehicle standards and requirements of § 1037.105 apply for the excluded vehicles. The GHG standards of 40 CFR part 1036 also apply for engines used in these excluded vehicles. If you are not the engine manufacturer, you must notify the engine manufacturer that its engines are subject to 40 CFR part 1036 because you intend to use their engines in your excluded vehicles.

(g) Analytically derived CO<sub>2</sub> emission rates (ADCs). This paragraph (g) describes an allowance to use estimated (i.e., analytically derived) CO<sub>2</sub> emission rates based on baseline test data instead of measured emission rates for calculating fleet-average emissions. Note that these ADCs are similar to ADFEs used for light-duty vehicles. Note also that F terms used in this paragraph (g) represent coefficients from the following road load equation:

$$\text{Force} - (\text{mass} \times \text{acceleration}) = F0 + F1 \cdot (\text{velocity}) + F2 \cdot (\text{velocity})^2$$

(1) Except as specified in paragraph (g)(2) of this section, use the following equation to calculate the ADC of a new vehicle from road load force coefficients (F0, F1, F2), axle ratio, and test weight:

$$\text{ADC} = \text{CO}_{2\text{base}} + 2.18 \cdot \Delta F0 + 37.4 \cdot \Delta F1 + 2257 \cdot \Delta F2 + 189 \cdot \Delta AR + 0.0222 \cdot \Delta \text{ETW}$$

Where:

ADC = Analytically derived combined city/highway CO<sub>2</sub> emission rate (g/mile) for a new vehicle.

CO<sub>2base</sub> = Combined city/highway CO<sub>2</sub> emission rate (g/mile) of a baseline vehicle.

ΔF0 = F0 of the new vehicle – F0 of the baseline vehicle.

ΔF1 = F1 of the new vehicle – F1 of the baseline vehicle.

ΔF2 = F2 of the new vehicle – F2 of the baseline vehicle.

ΔAR = Axle ratio of the new vehicle – axle ratio of the baseline vehicle.

ΔETW = ETW of the new vehicle – ETW of the baseline vehicle.

(2) The purpose of this section is to accurately estimate CO<sub>2</sub> emission rates.

(i) You must apply the provisions of this section consistent with good engineering judgment. For example, do not use the equation in paragraph (g)(1) of this section where good engineering judgment indicates that it will not accurately estimate emissions. You may ask us to approve alternate equations that allow you to estimate emissions more accurately.

(ii) The analytically derived CO<sub>2</sub> equation in paragraph (g)(1) of this section may be periodically updated through publication of an EPA guidance document to more accurately characterize CO<sub>2</sub> emission levels for example, changes may be appropriate based on new test data, future technology changes, or to changes in future CO<sub>2</sub> emission levels. Any EPA guidance document will determine the model year that the updated equation takes effect. We will issue guidance no later than eight months before the effective model year. For example, for 2014 models, the model year may start January 2, 2013, so guidance would be issued by May 1, 2012 for model year 2014.

(3) You may select, without our advance approval, baseline test data if they meet all the following criteria:

(i) Vehicles considered for the baseline test must comply with all applicable emission standards in the model year associated with the ADC.

(ii) You must include in the pool of tests considered for baseline selection all official tests of the same or equivalent basic engine, transmission class, engine code, transmission code, engine horsepower, dynamometer drive wheels, and compression ratio as the ADC subconfiguration. Do not include tests in which emissions exceed any applicable standard.

(iii) Where necessary to minimize the CO<sub>2</sub> adjustment, you may supplement the pool with tests associated with worst-case engine or transmission codes and carryover or carry-across engine families. If you do, all the data that qualify for inclusion using the elected worst-case substitution (or carryover or carry-across) must be included in the pool as supplemental data (i.e., individual test vehicles may not be selected for inclusion). You must also include the supplemental data in all subsequent pools, where applicable.

(iv) Tests previously used during the subject model year as baseline tests in ten other ADC subconfigurations must be eliminated from the pool.

(v) Select the tested subconfiguration with the smallest absolute difference between the ADC and the test CO<sub>2</sub> emission rate for combined emissions. Use this as the baseline test for the target ADC subconfiguration.

(4) You may ask us to allow you to use baseline test data not fully meeting the provisions of paragraph (g)(3) of this section.

(5) Calculate the ADC rounded to the nearest 0.1 g/mile. Except with our advance approval, the downward adjustment of ADC from the baseline is limited to ADC values 20 percent below the baseline emission rate. The upward adjustment is not limited.

(6) You may not submit an ADC if an actual test has been run on the target subconfiguration during the certification process or on a development vehicle that is eligible to be declared as an emission-data vehicle.

## Environmental Protection Agency

## § 1037.105

(7) No more than 40 percent of the subconfigurations tested in your final CO<sub>2</sub> submission may be represented by ADCs.

(8) Keep the following records for at least five years, and show them to us if we ask to see them:

- (i) The pool of tests.
  - (ii) The vehicle description and tests chosen as the baseline and the basis for the selection.
  - (iii) The target ADC subconfiguration.
  - (iv) The calculated emission rates.
- (9) We may perform or order a confirmatory test of any subconfiguration covered by an ADC.

(10) Where we determine that you did not fully comply with the provisions of this paragraph (g), we may require that you comply based on actual test data and that you recalculate your fleet-average emission rate.

(h) *Applicability of part 1037 provisions.* Except as specified in this section, the requirements of this part do not apply to vehicles certified to the standards of this section. The following provisions are the only provisions of this part that apply to vehicles certified under this section:

- (1) The provisions of this section.
- (2) The evaporative and refueling emission standards in §1037.103.
- (3) The air conditioning standards in §1037.115.
- (4) The interim provisions of §1037.150(a), (b), (c), (e)–(i), (l), and (m).
- (5) The definitions of §1037.801, to the extent such terms are used relative to vehicles subject to standards under this section.

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### § 1037.105 Exhaust emission standards for CO<sub>2</sub> for vocational vehicles.

(a) The standards of this section apply for the following vehicles:

- (1) Vehicles above 14,000 pounds GVWR and at or below 26,000 pounds GVWR, but not certified to the vehicle standards §1037.104.
- (2) Vehicles above 26,000 pounds GVWR that are not tractors.
- (3) Vocational tractors.
- (4) Vehicles at or below 14,000 pounds GVWR that are excluded from the

standards in §1037.104 under §1037.104 (f) or use engines certified under §1037.150(m).

(b) The CO<sub>2</sub> standards of this section are given in Table 1 to this section. The provisions of §1037.241 specify how to comply with these standards.

TABLE 1 TO § 1037.105—CO<sub>2</sub> STANDARDS FOR VOCATIONAL VEHICLES

GVWR (pounds)	CO <sub>2</sub> standard (g/ton-mile) for model years 2014–2016	CO <sub>2</sub> standard (g/ton-mile) for model year 2017 and later
GVWR ≤19,500 .....	388	373
19,500 <GVWR ≤33,000 ...	234	225
33,000 <GVWR .....	226	222

(c) No CH<sub>4</sub> or N<sub>2</sub>O standards apply under this section. See 40 CFR part 1036 for CH<sub>4</sub> or N<sub>2</sub>O standards that apply to engines used in these vehicles.

(d) You may generate or use emission credits under the ABT program as described in subpart H of this part. This requires that you specify a Family Emission Limit (FEL) for CO<sub>2</sub> for each vehicle subfamily. The FEL may not be less than the result of emission modeling from §1037.520. These FELs serve as the emission standards for the vehicle subfamily instead of the standards specified in paragraph (b) of this section.

(e) Your vehicles must meet the exhaust emission standards of this section throughout their full useful life, expressed in service miles or calendar years, whichever comes first. The following useful life values apply for the standards of this section:

(1) 110,000 miles or 10 years, whichever comes first, for vehicles at or below 19,500 pounds GVWR.

(2) 185,000 miles or 10 years, whichever comes first, for vehicles above 19,500 pounds GVWR and at or below 33,000 pounds GVWR.

(3) 435,000 miles or 10 years, whichever comes first, for vehicles above 33,000 pounds GVWR.

(f) See §1037.631 for provisions that exempt certain vehicles used in off-road operation from the standards of this section.

(g) You may optionally certify a vocational vehicle to the standards and useful life applicable to a higher vehicle service class (such as medium heavy-duty instead of light heavy-